

WHAT IS CLAIMED IS:

1. A hydraulic turbine adapted to introduce oxygen into water flowing through a water passageway of the turbine, the turbine comprising:

a rotatably mounted runner;

a draft tube extending downstream of the runner, the draft tube having a first inside wall;

a gas distribution manifold mounted to, and extending at least substantially around, the first inside wall of the draft tube, and the gas distribution manifold having a plurality of gas outlet ports distributed around the gas distribution manifold; and,

an oxygen containing gas supply passing through the first inside wall of the draft tube and being connected to the gas distribution manifold for supplying an oxygen containing gas to the gas distribution manifold whereby the oxygen containing gas flows around the gas distribution manifold within the draft tube and is discharged from the plurality of gas outlet ports of the gas distribution manifold into the water passageway to increase dissolved oxygen in the water discharged from the water passageway.

2. The hydraulic turbine of claim 1 wherein the oxygen containing gas is ambient air.

3. The hydraulic turbine of claim 2 wherein the ambient air is pressurized.

4. The hydraulic turbine of claim 1 wherein the oxygen containing gas is supplied under pressure.

5. The hydraulic turbine of claim 1 wherein at least one shroud is connected to the gas distribution manifold covering the gas outlet ports.

6. The hydraulic turbine of claim 1 wherein each of the gas outlet ports has a shroud covering providing a venturi arrangement responsive to flow of water along the water passageway.

7. The hydraulic turbine of claim 6 wherein the outlet ports vary in at least one of size, number, and positioning around the gas distribution manifold to control amounts of gas introduced into the water around the gas distribution manifold.

8. The hydraulic turbine of claim 1 wherein the gas distribution manifold comprises a second inside wall spaced from the first inside wall of the draft tube and a downstream inclined wall angled and extending from the second inside wall to the first inside wall of the draft tube, and wherein the plurality of gas outlet ports are located in the downstream inclined wall providing a venturi arrangement responsive to flow of water along the water passageway over the first and second inside walls.

9. The hydraulic turbine of claim 8 wherein the outlet ports vary in at least one of size, number, and positioning around the gas distribution manifold to control amounts of the oxygen containing gas introduced into the water around the gas distribution manifold.

10. The hydraulic turbine of claim 1 wherein the gas distribution manifold includes baffles for controlling volume of oxygen containing gas into the water passageway around the gas distribution manifold.

11. The hydraulic turbine of claim 1 positioned in a concrete foundation and wherein the draft tube further includes a man hole door permitting access through the first inside wall into the draft tube, a person access passageway leading to the man hole door located in the concrete foundation and the oxygen containing gas supply extending through the person access passageway and through the first inside wall of the draft tube adjacent the man hole door and into the gas distribution manifold.

12. The hydraulic turbine of claim 11 wherein the gas distribution manifold extends around the first inside wall of the draft tube except for a portion of the first inside wall where the man hole door is positioned.

13. The hydraulic turbine of claim 1 wherein a wall portion of the first inner wall of the draft tube forms part of the gas distribution manifold.

14. The hydraulic turbine of claim 8 wherein a wall portion of the first inner wall of the draft tube forms part of the gas distribution manifold.

15. A turbine installation configured to introduce oxygen into water passing through a water passage of a turbine, the installation comprising:

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a stationary casing for containing the turbine components and defining the water passageway, the casing extending from an upstream inlet to a downstream outlet and including a head cover and a discharge ring;

a runner rotatably disposed in the casing so that water flowing therethrough impinges on the runner;

a draft tube extending downstream of the runner, the draft tube having a first inside wall diverging outwardly in the downstream direction of water passing through the draft tube;

a gas distribution manifold mounted to, and extending at least substantially around, a wall portion of the first inside wall of the draft tube, the gas distribution manifold having a plurality of gas outlet ports spaced around the gas distribution manifold; and,

an oxygen containing gas supply passing through the first inside wall of the draft tube and being connected to the gas distribution manifold for supplying an oxygen containing gas whereby the oxygen containing gas flow around the gas distribution manifold and is discharged from the plurality of gas outlet ports into the water passageway to increase dissolved oxygen in the water discharged from the water passageway.

16. The turbine installation of claim 15 wherein the oxygen containing gas is ambient air.

17. The turbine installation of claim 16 wherein the ambient air is pressurized.

18. The turbine installation of claim 15 wherein the oxygen containing gas is supplied under pressure.

19. The hydraulic turbine of claim 15 wherein at least one shroud is connected to the gas distribution manifold covering the gas outlet ports.

20. The turbine installation of claim 15 wherein each of the gas outlet ports has a shroud covering for providing a venturi arrangement responsive to flow of water along the water passageway.

21. The turbine installation of claim 20 wherein the outlet ports vary in at least one of size, number, and positioning around the gas distribution

manifold to control amounts of gas introduced into the water around the gas distribution manifold.

22. The turbine installation of claim 15 wherein the gas distribution manifold comprises a second inside wall spaced from the first inside wall of the draft tube and a downstream inclined wall angled and extending from the second inside wall to the first inside wall of the draft tube, and wherein the plurality of gas outlet ports are located in the downstream inclined wall providing a venturi arrangement responsive to flow of water along the water passageway over the first and second inside walls.

23. The turbine installation of claim 22 wherein the outlet ports vary in at least one of size, number, and positioning around the gas distribution manifold to control amounts of the oxygen containing gas introduced into the water around the gas distribution manifold.

24. The turbine installation of claim 15 wherein the gas distribution manifold includes baffles for controlling volume of oxygen containing gas into the water passageway around the gas distribution manifold.

25. The hydraulic turbine of claim 15 positioned in a concrete foundation and wherein the draft tube further includes a man hole door permitting access through the first inside wall into the draft tube, a person access passageway leading to the man hole door located in the concrete foundation and the oxygen containing gas supply extending through the person access passageway and through the first inside wall of the draft tube adjacent the man hole door and into the gas distribution manifold.

26. The turbine installation of claim 25 wherein the gas distribution manifold extends around the first inside wall of the draft tube except for a portion of the first inside wall where the man hole door is positioned.

27. The turbine installation of claim 15 wherein the wall portion of the first inner wall of the draft tube forms part of the gas distribution manifold.

28. The turbine installation of claim 22 wherein the wall portion of the first inner wall of the draft tube forms a part of the gas distribution manifold.